

Center *for* Energy Economics
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LNG Access

California Energy Commission
Access Workshop June 1-2, 2005

Overview

- Trends in purchasing, selling LNG are influencing thinking about value chain development
- Views on access vary with market conditions
- Access to supply is competitive and sustainable
- Exporting countries want access to the value chain to achieve greater shares and benefits for their societies

LNG Value Chain

			
EXPLORATION & PRODUCTION	LIQUEFACTION	SHIPPING	REGASIFICATION & STORAGE
\$0.5-\$1.0/MMBtu	\$0.8-\$1.20/MMBtu	\$0.4-\$1.0/MMBtu	\$0.3-\$0.5/MMBtu

TOTAL = \$2.00 - \$3.70

Greatest variability is in upstream feedstock for liquefaction and shipping distance.

To the Terminal: Commercial Issues in Purchasing LNG

- Traditional LNG purchase contracts
 - Long term and rigid with pricing tied to oil
 - Buyers bore volume risk through take-or-pay clauses
 - LNG generally shipped in designated tankers and priced delivered ex-ship (d.e.s.)
 - Contained destination clauses that prevented resale to third parties and precluded arbitrage


Purchasing LNG: Commercial Issues

- New LNG purchasing practices
 - Long term contracts control bulk of trade but short-term market is emerging
 - Make-up provisions to manage volume risk
 - Buyer access rights to facility expansion
 - Loss of vessel cargos and prolonged unavailability of liquefaction/regasification facilities often considered force majeure
 - Loss or depletion of upstream reservoirs typically not force majeure

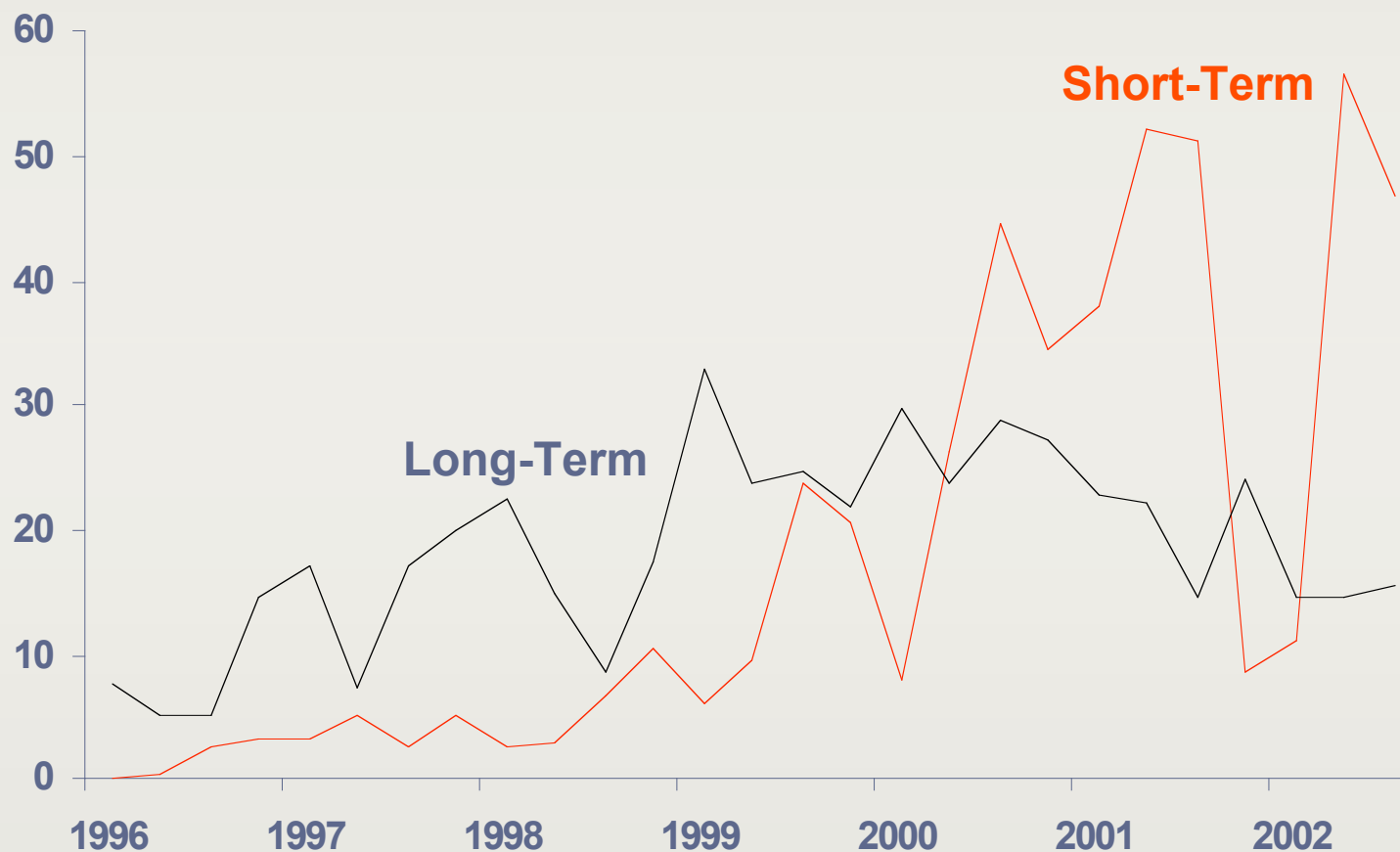
New LNG Purchasing Practices

- LNG in US tied to indexed short-term gas prices
- LNG shipped free on board (f.o.b.) which gives buyers more control over landed price and allows trading of surplus cargos
- Optionality/arbitrage embedded in shipping which has become strategic
- Emergence of “merchant” LNG traders with asset/facility positions in all components of the chain

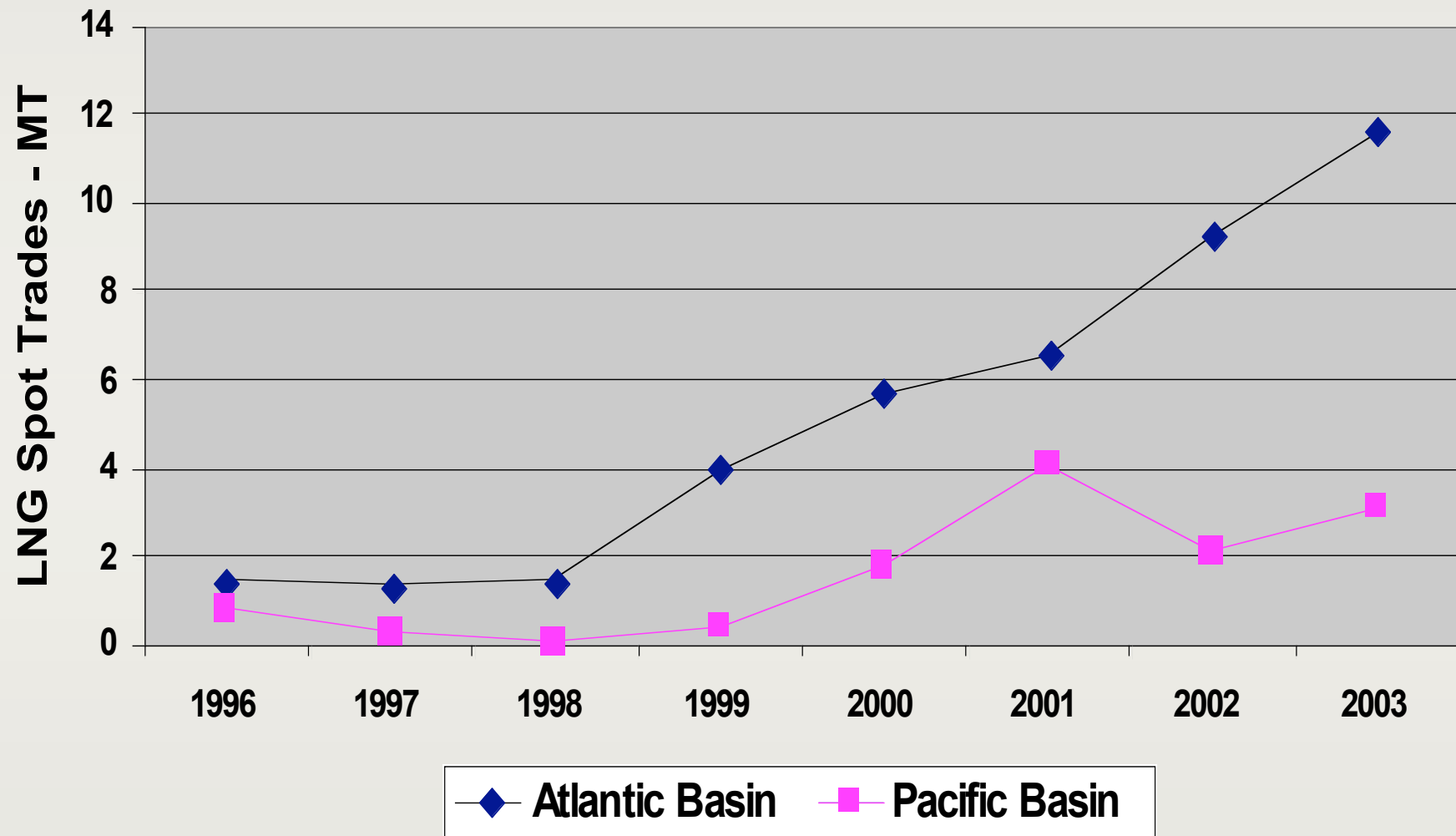
New LNG Contract Trend

	Old		New
Example Project	Australia - N.W. Shelf 1989		Trinidad - Atlantic LNG 1999
Sold To	Japan		US
Built with	High CAPEX		Low CAPEX
Sold through	Oil-indexed pricing		Gas-Gas competition
Sold with	Rigid Terms		Flexible Terms
Yielding	Low risk/Low return		High risk/High return

Quarterly LNG Imports by Contract Type (bcf)

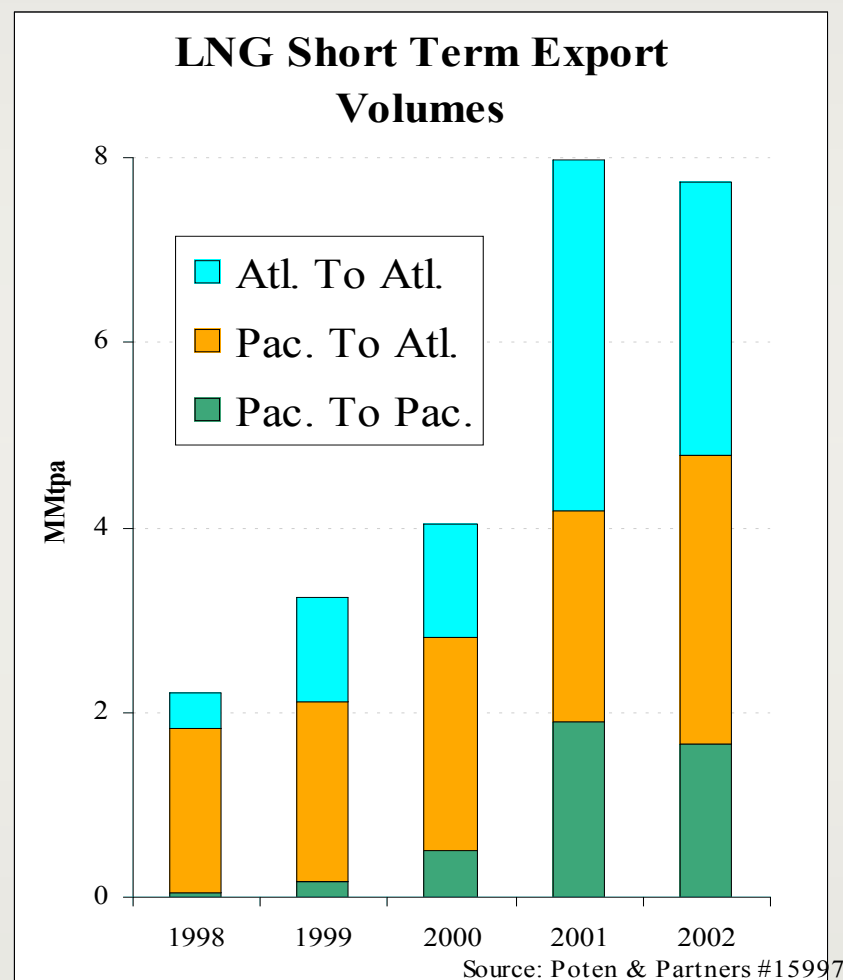


Emerging LNG Arbitrage



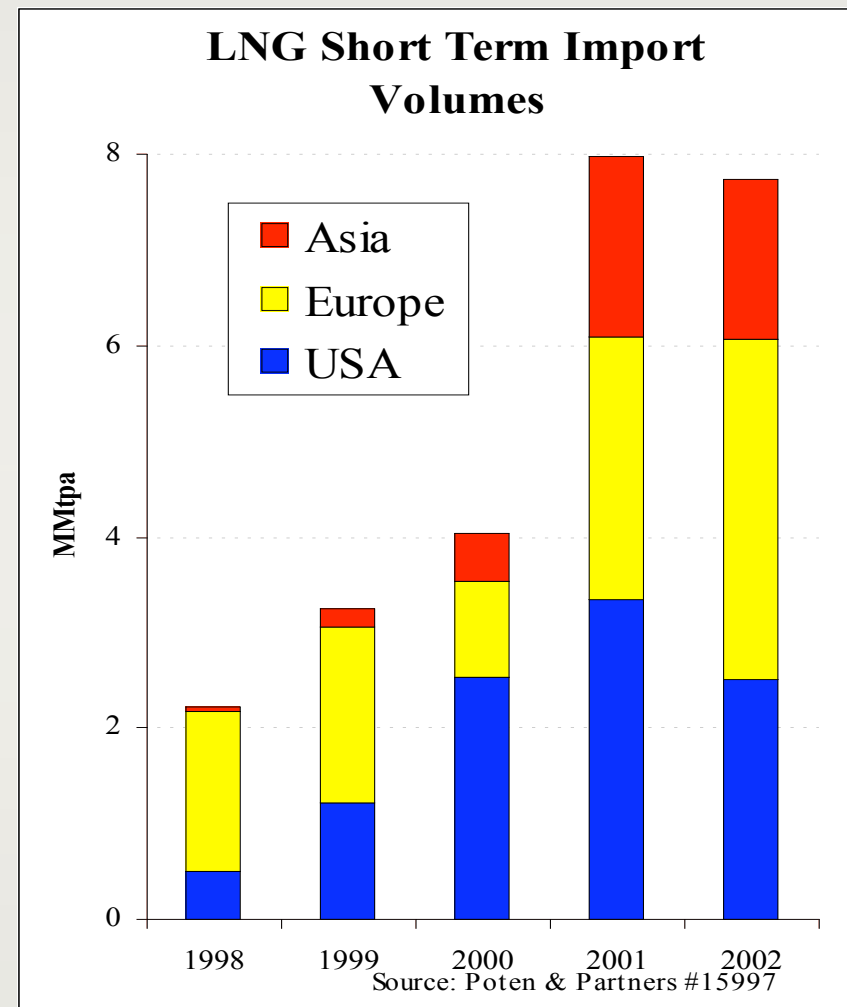
Growing Short-term Supplies

- From 2 to 8 MMtpa in 4 years
- Asia/Pacific supply largely to Atlantic
- Growing Atlantic short-term supply, from new projects in Nigeria and Trinidad



Growing Short-term Markets

- Growing US liquidity offers markets for global spare supply capacity
- Shift to Europe in 2002 reflects opportunistic exploitation of oil-based prices
- Asia import mostly Korea reflecting winter shortfall and stalled long-term contracting



Global Gas Market Evolution and Arbitrage: Why North America Matters



Orange arrows are generally LNG cargo flows to U.S./North America. Green arrows are generally price information flows with other markets.

Key considerations:

- Economic regulation of terminals
- Pipeline takeaway capacity
- NGL content of LNG cargos vs. terminal design and pipeline standards (interchangeability)
- Evolution of short term LNG contracting mechanisms
- Oil vs. gas Btu pricing

LNG Pricing

Asia

- LNG prices normally indexed to oil (eg., “Japanese Crude Cocktail”)
- LNG prices generally higher than elsewhere in the world
- ***China is breaking the trend***

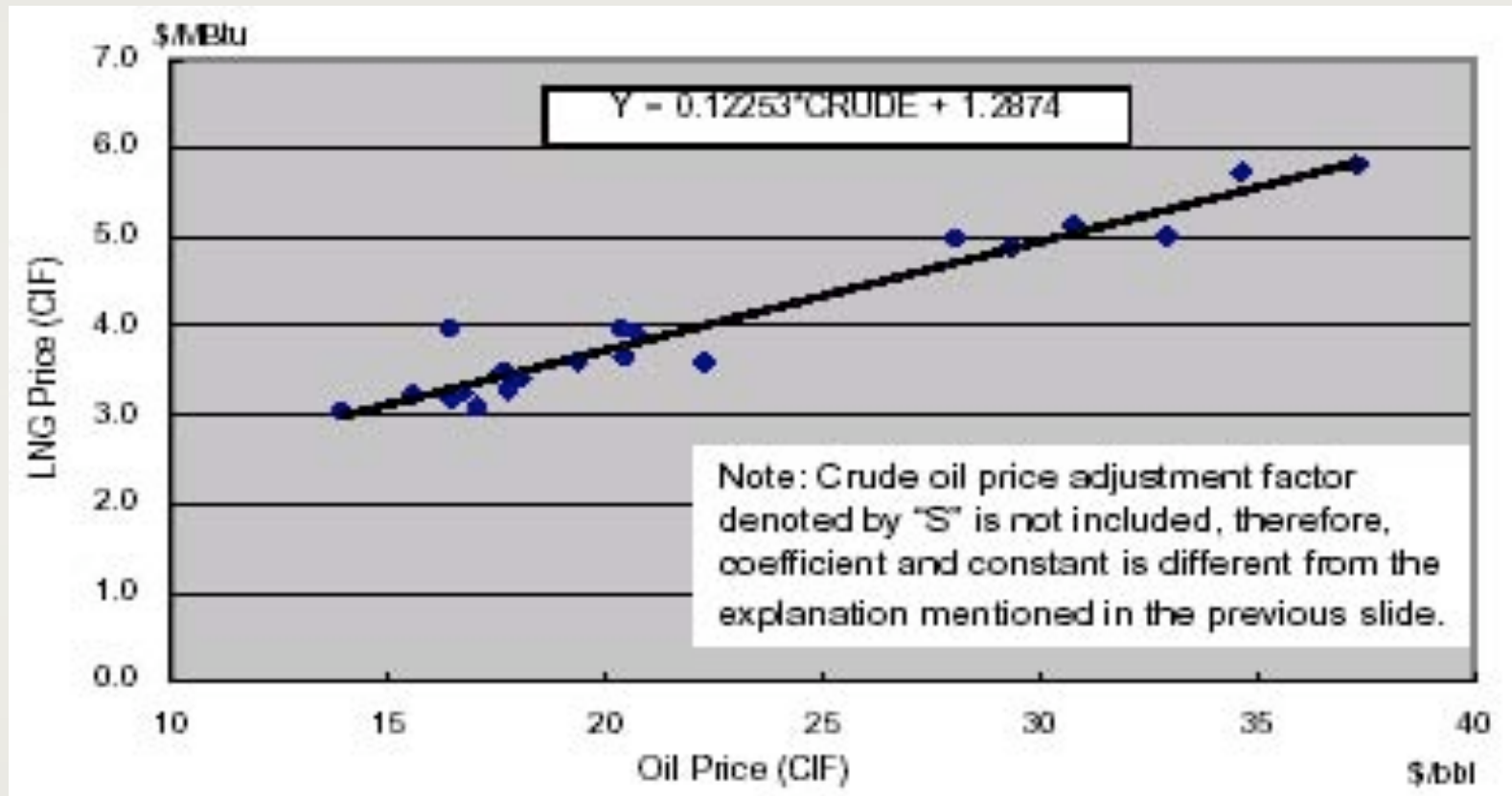
Europe

- LNG prices linked to fuel oil, light oil or basket of fuel oil, light oil, coal
- Recent development of new indices such as electricity pool price
- ***New links to natural gas spot and futures prices***
 - Contract between Trinidad and Tobago and Spain’s Gas Natural
- Lower prices; lower volatility

U.S.

- Generally linked to Henry Hub, adjusted to location of the LNG terminal
- ***Importers face high price volatility***

Correlation between LNG Price and Crude Oil Price



Source: IEA (2000, 2001), "Energy Prices and Taxes" for LNG price and EDMC Database (2002) for Crude Oil; Jung, Yonghun, Asia Pacific Energy Research Centre, An Outlook for Natural Gas Market in the APEC Region, Tokyo, 2003

LNG Pricing

The Netback Market Value Concept

- Netback = Delivered price of cheapest alternative fuel to the customer (including any taxes) adjusted for any differences in efficiency or in the cost of meeting environmental standards/limits;
 - Minus cost of transporting gas from the beach or border to the customer;
 - Minus cost of storing gas to meeting the customer's seasonal or daily demand fluctuations;
 - Minus any gas taxes and/or fees.

From the Terminal: Commercial Issues in Selling LNG

- Location and Volume
 - Primary & Secondary Delivery Points
 - Minimum Take Requirements
- Term
- Pressure/Quality Needs
- Pipeline Capacity
- Nature & Character of Service
 - Firm, Interruptible or Alternate Firm
 - Year Round vs. Seasonal

Selling LNG: Commercial Issues

- Nominations
- Pricing Structure
 - Commodity Price + Demand Charge
 - Indexed vs. Fixed Commodity Charge
 - Gas Release & Remarketing

Selling LNG: Commercial Issues

- Creditworthiness of Contracting Parties
- Remedies to Negative Changes in Credit Rating
- Force Majeure Provisions
- Contract Extension
- Failure to Perform/Liquidated Damages
- Dispute Resolution
 - Arbitration
 - Location

Selling LNG: Commercial Issues

- Producers vs. Aggregators as Suppliers
- Producer Attributes
 - Knowledge of supply source
 - Diversity of equity supply
 - Generally strong balance sheet
 - BUT customer must arrange transport
 - Generally unable/unwilling to remarket gas
 - Limited volume flexibility

Selling LNG: Commercial Issues

- Aggregator Attributes
 - Generally more willing to bear LNG FM risk
 - Multiple supply & transportation sources—greater flexibility
 - Perform nominations, scheduling and remarketing of supply & transport
 - Potential to share new pipeline construction risk
 - BUT weaker balance sheets and general credit issues of US merchant business

Challenges to “Commoditization” of LNG

- Non-standardization of LNG itself
- Non-standardization of purchase and sales contracts
- Availability of “uncommitted” ships
- Port compatibility issues for LNG ships
- Impediments to infrastructure construction
- Project financing requirements which mandate contractually integrated projects
- ***Implications for terminal development and access***

LNG Terminal Development in the U.S.

- Worldwide, LNG terminals have historically been developed by the end user for their own use – little or no third party use was permitted
- Even in places where *technically* third-party access to the LNG terminal was permitted, the owner of the terminal usually had control over the downstream market making gas market access difficult or impossible
- In the U.S., all the existing LNG terminals were *originally* built by and for a single end-user
- ***LNG purchasing/selling trends, U.S. regulatory environment, liquidity of the U.S. gas market = new business models for LNG terminal development***

LNG Terminal Development in the U.S.

- The business models for the 40+ proposed LNG terminals in North America can be categorized as either:
 - Only “Owner” Use (the historic norm)
 - Only Third-party Use
 - Mixed Third-party and Owner Use

Pros and Cons

Owner-User Terminal

- **Pro:** Maximum operating flexibility
- **Con:** Maximum financial commitment; can be very expensive on a per unit basis depending upon actual utilization

Only Third-party Use

- **Pro:** Customers can fit capacity to their needs and potentially can benefit from economies of scale from the participation of other customers
- **Con:** Customer flexibility is contracted; adapting the way the terminal operates is not as easy as in the Owner-User model

Mixed Third-party and Owner Use

- **Con:** Poor alignment of interests between owner and customers and thus inherent conflicts in allocation of resources of the terminal
- **Con:** Owner has structural and commercial advantages over customers in both supply acquisition and downstream gas marketing
- **Con:** Lacks transparency; owner/competitor is much less likely to be open with its customers

Alternative Approaches

- Developers/owners of multi-user terminals are taking different approaches in dealing with these decisions and trade-offs
 - Let the customers work it out; the operator treats a group of customers as a single customer
 - Maximize terminal utilization by restricting customer flexibility
 - Maximize services and terminal utilization through customer interdependency
 - Maximize services even at the cost of lower terminal utilization

The Function of LNG Terminals

- What services **should** LNG terminals provide their customers?
 - In a multi-user LNG terminal, these decisions are defined in the Terminal Use Agreement; customers and terminal owners may be “stuck” with decisions made during the negotiations
 - A major problem: there is very little multi-user terminal experience in the industry to draw from to get these contracts right

Value Trade-offs in LNG Terminals

- Temptation to try to **minimize the cost** of the import terminal either by **maximizing use** or **minimizing capital cost** of the terminal; a “penny-wise dollar-foolish” trade-off
- The total per-unit service cost of the LNG terminal is only 7%-15% of the price of gas (assuming \$3.00-\$7.00 gas prices)
- Terminal services can significantly affect how much value customers can realize from its LNG and gas (i.e., 93%-85% of the gas price)

Examples of Customer Value

(Terminal Service=Customer Profit)

Upstream of the terminal:

- LNG cargo diversion—incremental profits of \$0.50 to \$1.00/MMBtu or more
- “Spot” cargo incremental profits (\$ millions of dollars/cargo)
- *How much is the flexibility to add, reschedule and/or divert cargoes worth in a terminal fee?*

Downstream of the terminal:

- The daily basis differentials vs. monthly market (\$0.15-\$0.30/MMBtu difference on Gulf Coast)
- Requirement that customers have their LNG redelivered over a set number of days may force customers to potentially sell into the daily gas market rather than the monthly market (especially a problem for smaller customers)
- How much is the right to have a customer’s LNG redelivered ratably over a calendar month worth?

Services vs. Cost

- The services provided in a multi-user terminal also affect the commercialization of the terminal:
 - What infrastructure must be available (storage, peaking, number of docks, etc.)?
 - How many customers can be serviced (eg., can one-off “spot” customers be serviced)?
 - What type of customers can use the terminal?
 - What is the maximum utilization of the terminal?
- Flexibility and reliability are not cheap; all of these decisions directly affect the unit cost to the customer

Gas Exporting Countries Forum



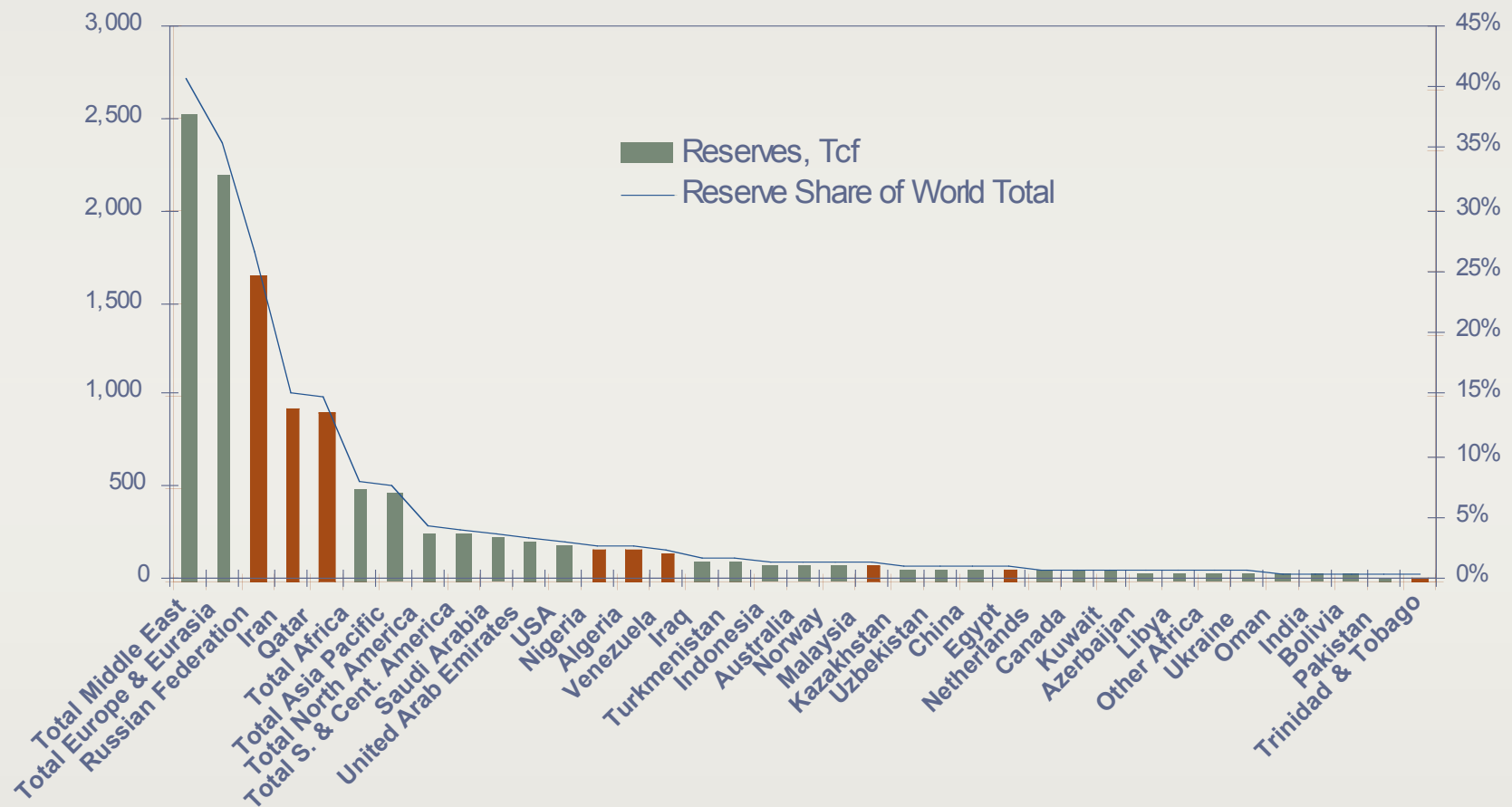
5th Gas Exporting Countries Ministerial Forum



From L to R: Mr. Ivan Orellana (Venezuela), Mr. Leong Yee Heim (Malaysia), Ambassador Shofry Abdul Ghafor, (Brunei Darussalam), His Excellency Mohammed Bin Dhaen AlHamli (United Arab Emirates), His Excellency Bijan Namdar Zangeneh (Iran), Mr. Mohamed Tawila (Egypt), The Hon. Eric A. Williams (Trinidad and Tobago), His Excellency Abdulla Bin Hamad Al Attiyah (Qatar), Mr. Youcef Ourradi (Algeria), Mr. Gabriel Nguema-Lima (Equatorial Guinea), Mr. Erik Johnsen (Norway), Her Excellency Hajia Amuna Lawan-Ali (Nigeria), Ambassador Vladimir Starikov (Russia).

April 26th-27th, 2005 (Trinidad and Tobago)

Who's Got Gas?



What do GECF members want?

- A larger share of profits

Increasing Local Value-Added & Creating Sustainability: TT Model



State entities are taking significant shares in liquefaction facilities.....

COUNTRY	NEW OFFSHORE LNG PRODUCTION	National Interest
EGYPT	BG, Petronas, Egypt	24.0%[[EGPC/EGAS]
NIGERIA	CVT,ENI,Conoco Phillips, NNPC	49.0%[NNPC]
QATAR	Exxon,Conoco,Mitsui,Marubeni,Total,QP	70.0% [QP]
NORWAY	Gaz DeFrance, Statoil Petro,Total,Amerada Hess, RWE DEA	33.53%[Statoil]
ALGERIA	Sonatrach +Partners	50.0% [Sonatrach]
TRINIDAD	BP,Repsol,Tractebel,BG,NGC	10.0% [NGC]

Representative LNG Shipping Rates

[Dollar per million Btu]

Exporter	Everett	Cove Point	Elba Island	Lake Charles
Algeria	0.52	0.57	0.60	0.72
Nigeria	0.8	0.83	0.84	0.93
Norway	0.56	0.61	0.64	0.77
Venezuela	0.34	0.33	0.3	0.35
Trinidad and Tobago	0.35	0.35	0.32	0.38
Qatar	1.37	1.43	1.46	1.58
Australia	1.76	1.82	1.84	1.84

Note: Prices based on a 138,000-cubic-meter tanker at a charter rate \$65,000 per day.

Source: LNG Shipping Solutions